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(54) Engine Cooling-fan Drive

(57) A hydrodynamic coupling (2) driving an engine cooling fan (5) is regulated by a thermostat (6) controlling the supply of working fluid and its impeller (1) has a slightly larger effective diameter than its turbine (4) so that working fluid can flow through the coupling for lubrication purposes without driving the turbine while engine cooling is not required. The fluid leaves the coupling via an opening (11). Shielded by baffle (12) which inhibits flow to the opening to prevent fluid leaving too rapidly under the influence of centrifugal force.

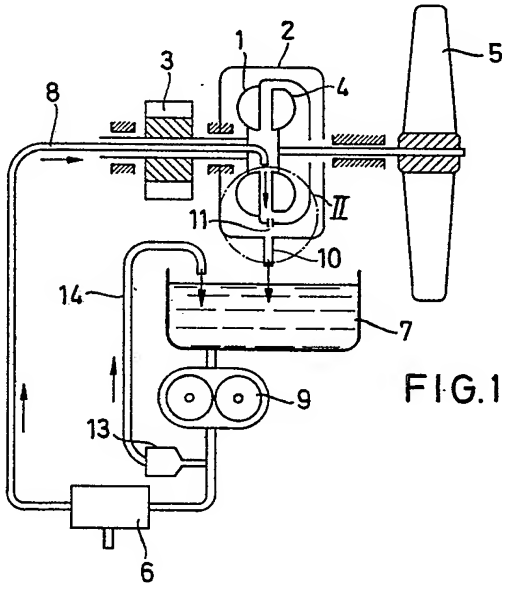

FIG.1

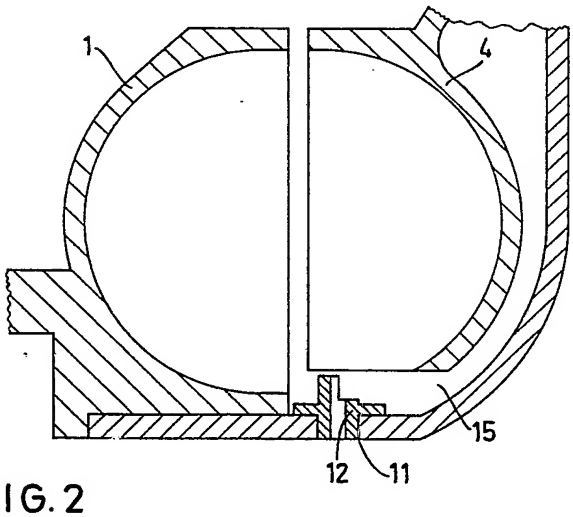

FIG.2

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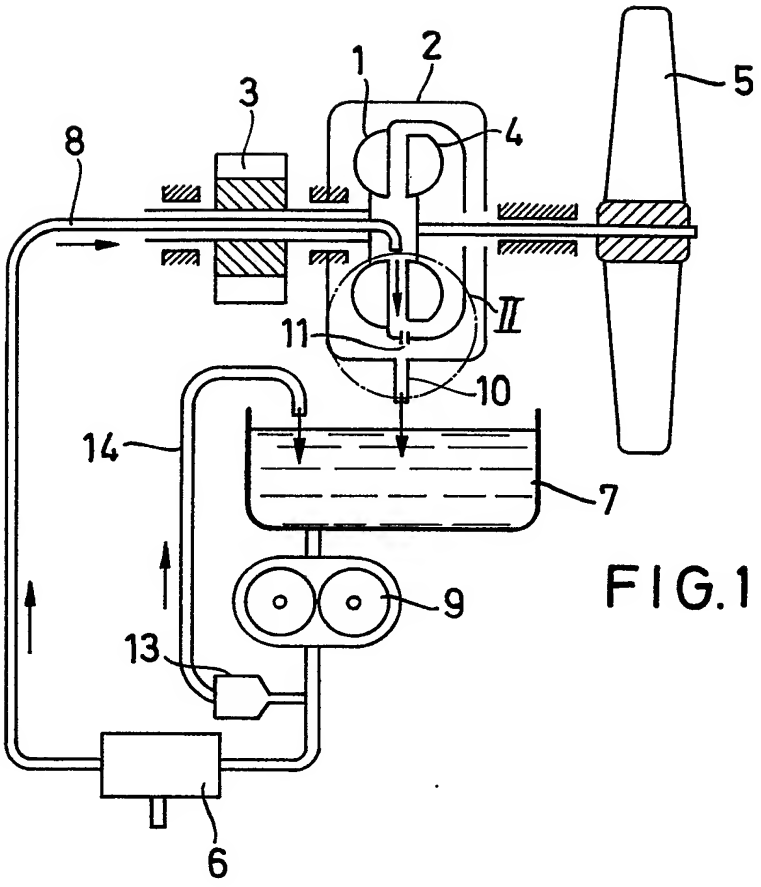

FIG.1

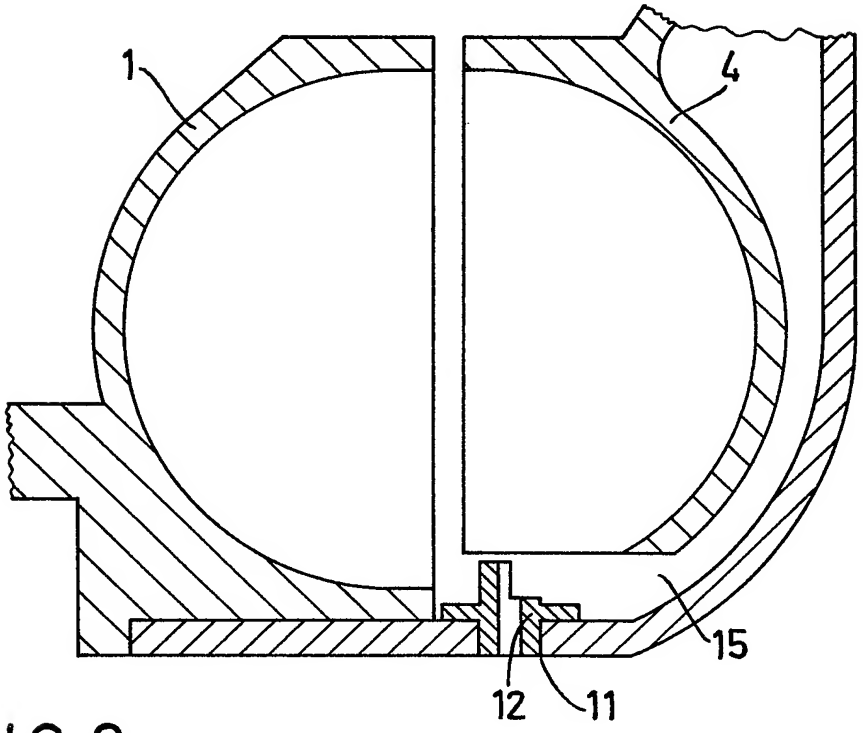

FIG.2

SPECIFICATION

A Cooling-Fan Drive

This invention relates to a cooling-fan drive comprising a hydrodynamic fan coupling whose volumetric efficiency is regulated by a thermostat controlling the supply of working medium.

A cooling-fan drive of this kind is known. The amount of working medium (lubricating oil) supplied in unit time to the coupling via the thermostat is dependent on the exhaust-gas temperature, or the temperature of a component. The amount of oil must not fall below a certain value, since the oil not only drives the fan coupling but also lubricates the fan bearings. For this reason, in known coupling devices, the secondary impeller speed must not fall below a given percentage of the primary impeller speed, so that the cooling fan runs at a low speed even when the internal combustion engine is idling. The result is that, owing to the small heat supply from the engine, the temperature of the component may fall excessively.

An object of the invention is to provide a fan drive which has practically zero speed when the engine is idling but still ensures that the fan bearings are lubricated. To this end, the invention provides a cooling-fan drive comprising a hydrodynamic fan coupling whose volumetric efficiency is regulated by a thermostat controlling the supply of working medium, in which the primary impeller has a slightly larger effective diameter than the secondary impeller, and a radially inwardly extending device is disposed at a discharge bore in the neighbourhood of the secondary impeller to prevent the working medium from flowing out smoothly.

As the result of using the invention a clearance volume is formed in the neighbourhood of the secondary impeller and when the load on the internal combustion engine is low, the stream of oil flowing through the clearance volume is sufficient to lubricate the bearings but does not operate the coupling effectively, so that the fan does not rotate at an appreciable speed. Consequently, the temperature of the component can be kept within an optimum range.

When the primary impeller speed increases (if the oil flow is small and constant) the oil film becomes progressively thinner due to centrifugal force, so that the tips of the secondary vanes fail to engage. As a result, the component would be at an excessively high temperature at low engine speed. According to a feature of the invention, however, this is avoided in that a radially inwardly extending preventing the working medium from flowing out smoothly is disposed at a discharge bore in the neighbourhood of the secondary impeller. The resulting damming effect increases the thickness of the layer of working medium in the secondary region at high speed. It slightly increases the cooling effect and maintains the temperature of the component within the permitted limits.

An embodiment of the invention is shown in the accompanying drawings, in which:—

Figure 1 is a diagram of a cooling-fan drive according to the invention; and

Figure 2 shows a detail marked II in Figure 1 on a larger scale.

In the drawings, reference numeral 1 denotes a primary impeller of a hydrodynamic fan coupling 2 driven by an internal combustion engine (not shown) via a gearwheel 3. A secondary impeller 4 drives a cooling fan 5.

The working medium of the hydrodynamic fan coupling 2, which can also be the lubricating oil of the engine, is drawn by a pump 9 from a lubricating-oil container 7 and sent to the bellows coupling through a thermostat 6 and a pipeline 8. Due to centrifugal force, the oil issues from a small bore 11 and is returned to container 7 through a pipeline 10. Bore 11 contains a device 12 which projects radially inwardly and prevents the working medium from flowing out smoothly. The delivery pressure of pump 9 is limited by a pressure-regulating valve 13 connected by a return pipeline 14 to container 7.

The cooling-fan drive operates as follows:—

When the engine is idling, the oil supply to the fan coupling 2 is limited to a minimum by thermostat 6. The remaining oil flows through clearance volume 15 and away through bore 11. The clearance volume 15 is in the neighbourhood of the secondary impeller 4, which has a slightly smaller effective diameter than the primary impeller 1. At speeds somewhat above idling speeds, the thickness of the layer of working medium decreases so much, as the result of centrifugal force, that the fan speed is not sufficiently increased, in spite of the increased amount of component heating and the resulting increase in the flow of working medium brought about by thermostat 6. This is the reason for providing the device 12. Under the last-mentioned operating conditions, the device 12 hinders the flow of working medium, so that the tips of the secondary impeller 4 are immersed to a small depth, thus ensuring adequate fan speed and cooling.

Claims

1. A cooling-fan drive comprising a hydrodynamic fan coupling whose volumetric efficiency is regulated by a thermostat controlling the supply of working medium, in which the primary impeller has a slightly larger effective diameter than the secondary impeller, and a radially inwardly extending device is disposed at a discharge bore in the neighbourhood of the secondary impeller to prevent the working medium from flowing out smoothly.

2. A cooling-fan drive comprising a hydrodynamic fan coupling whose volumetric efficiency is regulated by a thermostat controlling

the supply of working medium, constructed and arranged substantially as herein described, with reference to and as illustrated in the accompanying drawings.

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ABSTRACT:

CHG DATE=19990617 STATUS=O> A hydrodynamic coupling (2) driving an engine cooling fan (5) is regulated by a thermostat (6) controlling the supply of working fluid and its impeller (1) has a slightly larger effective diameter than its turbine (4) so that working fluid can flow through the coupling for lubrication purposes without driving the turbine while engine cooling is not required. The fluid leaves the coupling via an opening (11). Shielded by baffle (12) which inhibits flow to the opening to prevent fluid leaving too rapidly under the influence of centrifugal force. □